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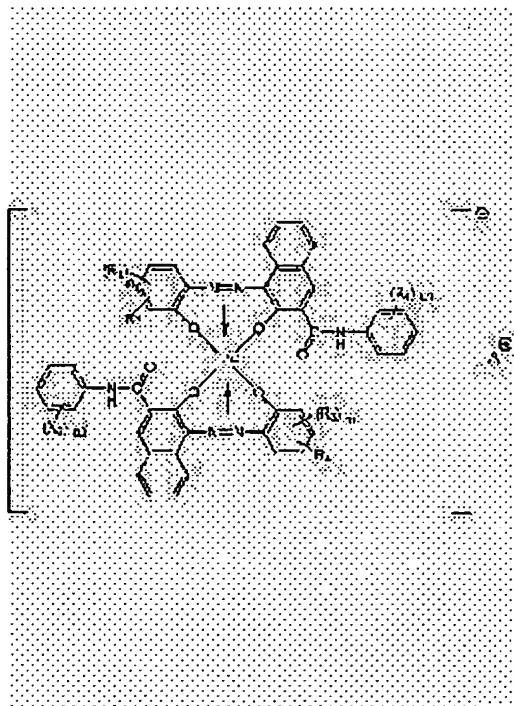
## (54) ELECTROSTATIC CHARGE IMAGE DEVELOPING TONER

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide electrostatic charge image developing toners which exhibit good fixing and offset characteristic in a broad temperature region, have excellent color reproducibility and transparency, exhibit a stable electrostatic charge behavior at the time of continuous printing and makes images of good and high image quality obtainable.

**SOLUTION:** The electrostatic charge image developing toners are toners containing at least a binder resin, coloring agents and a charge control agent, in which the binder resin contains a polyester resin obtained by reacting a polybasic acid compound selected from bivalent and higher valence polybasic acids and/or acid anhydrides and/or their lower alkyl ester and a

cyclohexane dimethanol as the main components and the charge control agent contains the complex expressed by general formula (1) or its salt.



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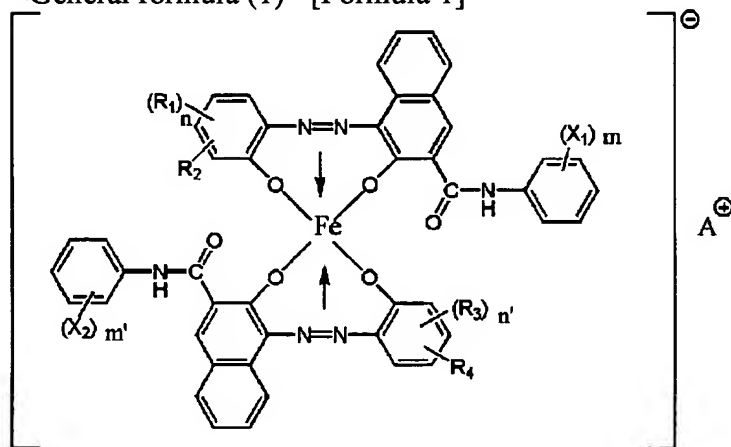
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## CLAIMS

## [Claim(s)]

[Claim 1] The toner for electrostatic-charge image development which it is the toner which comes to contain binder resin, a coloring agent, and an electrification control agent at least, and said binder resin contains the polyester resin to which the polybasic acid compound chosen from the polybasic acid, the acid anhydrides, and/or these low-grade alkyl ester more than divalent and cyclohexane dimethanol were made to react as a principal component, and contains the complex or salt as which said electrification control agent is expressed in the following general formula (1).

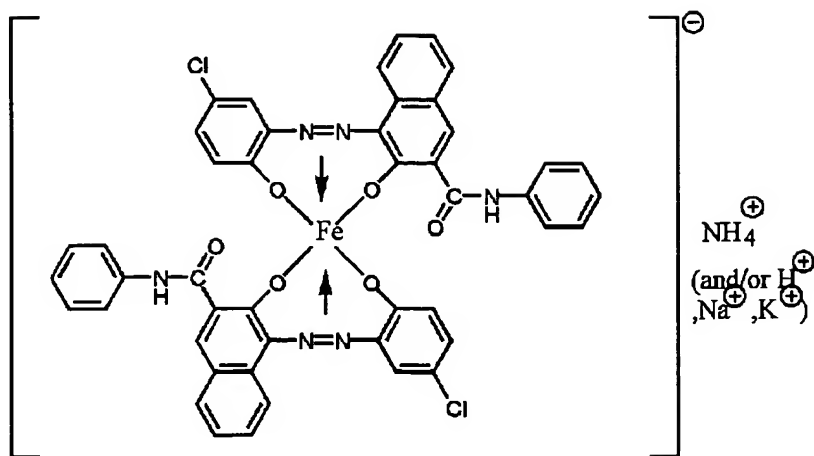
<General formula (1)> [Formula 1]



X1 and X2 among [type A hydrogen atom, a low-grade alkyl group, a lower alkoxy group, A nitro group or a halogen atom is expressed, and even if Xtwo are the same as Xone, you may differ. m and m' expresses the integer of 1-3. R1 and R3 A hydrogen atom, The alkyl of carbon numbers 1-18, the alkenyl, a sulfonamide, mesyl, Alkoxy [ of a sulfonic acid, carboxy ester, and the hydroxy \*\* carbon numbers 1-18 ] \*\* Acetylamino, a benzoylamino radical, or a halogen atom is expressed. May differ, even if R3 are the same as R1, and n and n' expresses the integer of 1-3. R2 and R4 express a hydrogen atom or a nitro group, and A+ shows cation ion and expresses ammonium ion, a hydrogen ion, sodium ion, potassium ion, or those mixed ion. ]

[Claim 2] The toner for electrostatic-charge image development according to claim 1 using the naphthalene dicarboxylic acid, its acid anhydride, and/or its low-grade alkyl ester beyond 1 mol % as said polybasic acid compound.

[Claim 3] The toner for electrostatic-charge image development according to claim 1 which is the complex or salt as which said electrification control agent is expressed in the <electrification control agent 1> of the following structure. <Electrification control agent 1> [Formula 2]



[Claim 4] Furthermore, the toner for electrostatic-charge image development containing the wax which contains a higher-fatty-acid ester compound and/or a fatty alcohol compound as a release agent according to claim 1.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

**[0001]**

**[Field of the Invention]** This invention relates to the toner for electrostatic-charge image development used for a xerography, an electrostatic recording method, or an electrostatic printing method.

**[0002]**

**[Description of the Prior Art]** In a copying machine, a printer, etc. using the principle of a xerography, an electrostatic latent image is formed on the photo conductor which consisted of organic photo conductors, such as inorganic photo conductors, such as a selenium, or a polyvinyl carbazole, and a phthalocyanine, and the development approach which the developer containing the dry type toner which electrified this beforehand is supplied, and is used as a visible image is taken.

**[0003]** The developer used in order to develop an electrostatic latent image is divided roughly into the magnetic 1 component developer to which it carries out internal [ of the magnetic fine particles, such as iron powder, ], the nonmagnetic 1 component developer which does not use iron powder as a carrier, or the two component developer which mixes and uses a toner particle and a magnetic carrier.

**[0004]** By the way, in the nonmagnetic 1 component development method, although various approaches are devised from the former, the many make a toner adhere in electrostatic force on a development sleeve, a toner is made to convey to the electrostatic latent image formed on the photo conductor by rotating a development sleeve, and the approach of making it develop is used. By such nonmagnetic 1 component development method, maintenance of the toner to a development sleeve top is dependent only on the electrostatic force between the development sleeve produced when a toner is charged, and a toner. On the other hand, as a device in which a toner is electrified in a nonmagnetic 1 component development method, a toner is made to pass between the electrification members by which the pressure welding was generally carried out to a development sleeve and it, and the approach of carrying out frictional electrification of the toner is taken. Therefore, in order to hold a toner on a development sleeve certainly and to convey it to a photo conductor front face, in case a toner passes the pressure-welding section of a development sleeve and an electrification member, to reach the amount of electrifications of a correct level in an instant is needed.

**[0005]** On the other hand, in a 2 component development method, the carrier shares functions, such as stirring of a developer, conveyance, and electrification, and functional separation of a carrier and a toner is clear. Therefore, since electrification control of a toner is comparatively easy, the 2 component development method is used widely. In this method, the electrification standup nature of the toner at the time of the toner makeup after multi-number-of-copies printing has been an important technical problem especially not to mention the amount of electrifications and electrification stability of a toner in a developer being important.

**[0006]** In order to fulfill these demand characteristics, various examination is made in the toner used for each development method. Especially selection of an electrification control agent is important. In an electrification control agent, the electrification control agent of various frames, such as salicylic-acid metal complexes, such as zinc, aluminum, and chromium, quarternary ammonium salt, a trimethyl

ethane system color, and metallic complex azo dye, has been examined to current. However, the toner for electrostatic-charge image development with which are satisfied of many aforementioned properties demanded in a nonmagnetic 1 component development method and a 2 component development method is not found out. In recently, development of the printer of a high-speed printing application using each development method is performed especially, and the toner for electrostatic-charge image development suitable for such a machine is not found out.

[0007] Moreover, in polyester resin, although styrene acrylic resin, polyester resin, etc. are used as binder resin of a toner, in case it passes through between the electrification members by which the pressure welding was carried out to a development sleeve and it in the case of a nonmagnetic 1 component development method, it condenses by friction, adheres to a development sleeve, and is in the inclination which the trouble of reducing image quality generates. Furthermore, in the 2 component development method, accumulation is carried out by friction with a toner, a carrier, or a magnet roll at the time of continuation printing, it is easy to cause heat condensation, and the amelioration is desired.

[0008] On the other hand, as a method established in a toner image, although the heat roll fixation method is generally used widely, fixable [ good ] and offset-proof nature in that case are also the aforementioned electrification property and an important property for which a toner is asked similarly. In the latest copying machine or a printer, improvement in the speed of processing speed is performed, and fixation temperature is becoming low temperature with a fixation time amount nearby short time more. Although the resin which fuses at low temperature more and can hold elasticity to an elevated temperature in the binder resin of a toner is call for since it corresponds to such a demand, low-melt point point-ization of resin causes lowering of Tg, and causes heat condensation inside the aforementioned developer, and makes the preservation stability under an elevated temperature get worse.

[Problem(s) to be Solved by the Invention] Also when this invention carries out continuation printing, it shows stable electrification behavior, and it is to offer the toner for electrostatic-charge image development with which a high-definition image with the good standup property of electrification is obtained.

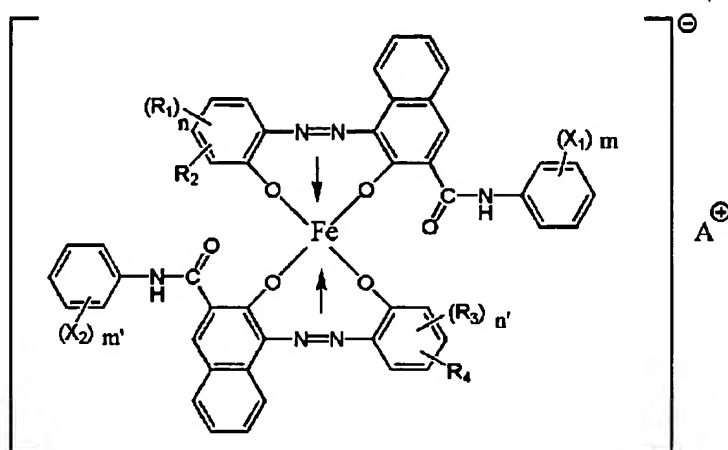
[0009] Moreover, adhesion in the heat condensation or developer in the interior of a developer does not occur, but the preservation stability under an elevated temperature is good, and is established more at low temperature, and other objects of this invention aim at offering the toner for electrostatic-charge image development suitable for a heat roll fixation method in which good fixation / offset property is shown in a broad temperature field.

[0010]

[Means for Solving the Problem] this invention persons reached this invention, as a result of repeating research wholeheartedly that the above-mentioned technical problem should be solved.

[0011] In order that this invention may solve the above-mentioned technical problem, at least Namely, binder resin, It is the toner which comes to contain a coloring agent and an electrification control agent. Said binder resin The polyester resin to which the polybasic acid compound chosen from the polybasic acid, the acid anhydrides, and/or these low-grade alkyl ester more than divalent and cyclohexane dimethanol were made to react as a principal component is contained. Said electrification control agent offers the toner for electrostatic-charge image development containing the complex or salt expressed with the following general formula (1).

<General formula (1)> [Formula 3]



X1 and X2 among [type A hydrogen atom, a low-grade alkyl group, a lower alkoxy group, A nitro group or a halogen atom is expressed, and even if Xtwo are the same as Xone, you may differ. m and m' expresses the integer of 1-3. R1 and R3 A hydrogen atom, The alkyl of carbon numbers 1-18, the alkenyl, a sulfonamide, mesyl, Alkoxy [ of a sulfonic acid, carboxy ester, and the hydroxy \*\* carbon numbers 1-18 ] \*\* Acetyl amino, a benzoyl amino radical, or a halogen atom is expressed. May differ, even if R3 are the same as R1, and n and n' expresses the integer of 1-3. R2 and R4 express a hydrogen atom or a nitro group, and A<sup>+</sup> shows cation ion and expresses ammonium ion, a hydrogen ion, sodium ion, potassium ion, or those mixed ion. ]

[0012]

[Embodiment of the Invention] As a polybasic acid compound chosen from the polybasic acid more than divalent and/or the acid anhydrides which are used in order to manufacture the toner for electrostatic-charge image development of this invention, and/or these low-grade alkyl ester For example, phthalic anhydride, a terephthalic acid, isophthalic acid, an orthochromatic phthalic acid, Naphthalene dicarboxylic acid, an adipic acid, a maleic acid, a maleic anhydride, A fumaric acid, an itaconic acid, a citraconic acid, hexahydro phthalic anhydride, Tetrahydro phthalic anhydride, cyclohexane dicarboxylic acid, a succinic acid, Dicarboxylic acid, its derivative, or its esterification objects, such as a malonic acid, a glutaric acid, an azelaic acid, and a sebacic acid Moreover, the multiple-valued carboxylic acid, its derivative, or its esterification objects of three or more organic functions, such as trimellitic acid, trimellitic anhydride, pyromellitic acid, and pyromellitic dianhydride, are mentioned, for example.

[0013] Moreover, as cyclohexane dimethanol used by this invention, although there are various isomers, 1 and 4-cyclohexane dimethanol is desirable. Fixable [ in low temperature ] becomes good [ polyester resin using cyclohexane dimethanol as an alcoholic component ]. Moreover, Tg of resin becomes high. Therefore, the preservation stability under an elevated temperature becomes good, and adhesion in the heat condensation or developer in the interior of a developer does not occur. Furthermore, although adding a wax in a toner is a means generally used, especially with the polyester resin using the cyclohexane dimethanol in this invention, the compatibility of waxes is good and the fixation engine performance and offset-proof nature in low temperature are further improved, in order to improve fixation / offset engine performance.

[0014] Furthermore, in the polyester resin used by this invention, it is desirable to use together and use the aliphatic series polyhydric alcohol more than divalent with cyclohexane dimethanol as an alcoholic component. As a concrete compound, for example Ethylene glycol, a diethylene glycol, Triethylene glycol, propylene glycol, dipropylene glycol, Tripropylene glycol, butanediol, pentanediol, hexandiol, A polyethylene glycol, a polypropylene glycol, ethyleneoxide-propylene oxide random-copolymer diol, Ethyleneoxide-propylene oxide block-copolymer diol, Diols, such as ethyleneoxide-tetrahydro furan copolymer diol and the poly KAPUROKAKU ton diol Moreover, a sorbitol, 1, 2 and 3, 6-hexane tetra-ol, 1, 4-sorbitan, Pentaerythritol, 1 and 2, 4-butane triol, 1 and 2, 5-pentanetriol, A glycerol, isobutane triol, 2-methyl - The polyhydric alcohol, 1, 2, 4-butane triol, trimethylolethane, trimethylol propane, 1

and 3, 5-TORIMECHI roll benzene, etc., of three or more organic functions is mentioned. By using the polyester resin using these aliphatic series polyhydric alcohol as binder resin, the low-temperature fixable one of a toner becomes better.

[0015] Furthermore, epoxy compounds, such as neopentyl glycol diglycidyl ether, glycerol triglycidyl ether, trimethylolpropane triglycidyl ether, trimethylolethane triglycidyl ether, and pentaerythritol tetraglycidyl ether, can also be used together with cyclohexane dimethanol, and can be used.

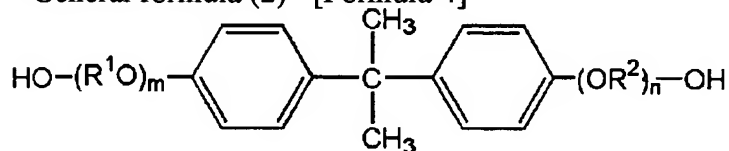
[0016] As for the amount of the cyclohexane dimethanol used, it is desirable that it is more than 20 mol % to all alcoholic components, and it is more desirable that it is more than 40 mol %. Furthermore, it is desirable that it is especially more than 60 mol %.

[0017] Moreover, in this invention, the polyhydric alcohol more than aromatic series diol or trivalent can also be used together in the range which does not affect the engine performance. As polyhydric alcohol more than aromatic series diol or trivalent, a catechol, resorcinol, a hydroquinone, the bisphenol A mold epoxy resin, a bisphenol female mold epoxy resin, a bisphenol smooth S form epoxy resin, a cresol novolak mold epoxy resin, a phenol novolak mold epoxy resin, etc. are mentioned, for example.

[0018] As for the amount using the above-mentioned aromatic series diol, it is desirable that it is less than [ 30 mol % ] to all alcoholic components. It is less than [ 20 mol % ] more preferably.

[0019] Furthermore, the compound which has the bisphenol A frame expressed with the following general formula (2) can also be used in the range which does not spoil the object of this invention.

<General formula (2)> [Formula 4]



the inside of a formula, and R1 and R2 are the same -- or you may differ and ethylene or a propylene radical is shown. moreover, m and n are the same -- or you may differ, and the integer of 0-7 is shown, and m+n shows the integer of 0-7.

[0020] As a compound expressed with a general formula (2), specifically For example, bisphenol A, a polyoxyethylene - (2.2) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxyethylene - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene -(2.2)- Polyoxyethylene - (2.0) -2, a 2-bis(4-hydroxyphenyl) propane, A polyoxypropylene-(6)-2 and 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene - (2.2) -2, a 2-bis(4-hydroxyphenyl) propane, Polyoxypropylene - (2.4) -2, a 2-bis(4-hydroxyphenyl) propane, polyoxypropylene - (3.3) -2, 2-bis(4-hydroxyphenyl) propanes, these derivatives, etc. are mentioned. As for the compound expressed with a general formula (2), it is desirable that it is less than [ 30 mol % ] to all alcoholic components. It is less than [ 20 mol % ] more preferably. It is less than [ 10 mol % ] especially preferably.

[0021] Moreover, as a carboxylic-acid component used by this invention, a terephthalic acid, isophthalic acid, an orthochromatic phthalic acid, and naphthalene dicarboxylic acid are desirable, and dimethyl naphthalate, diethyl naphthalate, dibutyl naphthalate, etc. are more suitably used as naphthalene dicarboxylic acid and/or its low-grade alkyl ester. These naphthalene dicarboxylic acid and/or its derivative need to use more than 1 mol % of all acid components, and are more than 5 mol % more preferably.

[0022] A monomer including a naphthalene ring structure has effectiveness in raising Tg of resin, and its heat-resistant coherent one of resin improves. In the system which used elastic aliphatic series system diol for the subject especially as an alcoholic component, lowering of Tg of resin can be suppressed and the resin having the low-temperature fixable one by using aliphatic series system diol and coherent [ heat-resistant / both / by naphthalene dicarboxylic acid ] can be obtained.

[0023] The polyester resin used by this invention can be obtained by performing a dehydration condensation reaction or an ester exchange reaction using the above-mentioned raw material component under existence of a catalyst. Although especially the reaction temperature and reaction time in this case



are not limited, they are usually 2 - 24 hours at 150-300 degrees C.

[0024] As a catalyst at the time of performing the above-mentioned reaction, tetrabutyl titanate, a zinc oxide, the first tin of oxidization, dibutyl tin oxide, a dibutyl tin JIRAU rate, Para toluenesulfonic acid, etc. can be used suitably, for example.

[0025] Although the glass transition temperature (Tg) of the polyester resin used for this invention has a desirable thing 50 degrees C or more, the Tg of especially a thing 55 degrees C or more is desirable especially. Tg tends to produce blocking high (heat condensation), when a toner is exposed to the bottom of an elevated temperature inside preservation, haulage, or the developer of a machine below 50 degrees C.

[0026] moreover, as softening temperature of the polyester resin used for this invention, the thing of the range of 90 degrees C - 180 degrees C is desirable also in 90 degrees C or more -- it is the range of 95 degrees C - 160 degrees C more preferably. When softening temperature is less than 90 degrees C, a toner tends to produce isoagglutination and tends to become a trouble in the time of preservation, or the case of printing, and in exceeding 180 degrees C, fixable worsens in many cases.

[0027] furthermore, as the object for color toners, or an object for black toners used with a color toner, when the fixation engine performance in low temperature is required more, as softening temperature of polyester resin, the thing of the range of 90 degrees C - 130 degrees C is desirable -- it is the range of 95 degrees C - 120 degrees C more preferably. As the acid number of the polyester resin of this invention, it is desirable that they are 20 or less mgKOH/g at the point that the moisture resistance of a toner becomes good.

[0028] As a coloring agent which can be used by this invention, they are carbon black, such as the furnace black and channel black which are classified according to a process as a black coloring agent, acetylene black, thermal black, and lamp black, or C.I.Pigment, for example. Black The ferric acid ghost system pigment of 11, C.I.Pigment Black The iron-titanic-acid ghost system pigment of 12, the cyanine black BX of a phthalocyanine system, etc. are raised. Moreover, it can also be used using two kinds or more as a toner of a chromatic color of pigments using the pigment of the chromatic color illustrated below, toning black.

[0029] As a coloring agent of the blue system which can be used for the toner for electrostatic-charge image development of this invention, it is C.I.Pigment of a phthalocyanine system. Blue 1, 2, 15:1, 15:2, 15:3, 15:4, 15:6, 15 and 16, 17:1, 27, 28, 29, 56 and 60, and 63 grades are mentioned. as the coloring agent of a blue system -- desirable -- C.I.Pigment Blue 15:3 (generic name copper phthalocyanine blue G), 15 (copper phthalocyanine blue R), 16 (non-metal copper phthalocyanine blue), and 60 (indanthrone blue) mention -- having -- most -- desirable -- C.I.Pigment Blue 15: -- 3 and 60 are mentioned.

[0030] As a coloring agent of a yellow system, moreover, for example C. I.Pigment Yellow 1, 3, 4, 5, 6, 12, 13, 14, 15, 16, 17, 18, 24, 55, 65, 73, 74, 81, 83, 87, 93, 94, 95, 97, 98, 100, 101, 104, 108, 109, 110, 113, 116, 117, 120, 123, 128, 129, 133, 138, 139, 147, 151, 153, 154, 155, 156, 168, 169, 170, 171, and 172, 173, 180, 185 grades are mentioned. Preferably, it is C.I.Pigment. Yellow 12 (generic name Diarylide Yellow AAA), 13 (Diarylide Yellow AAMX), 17 (Diarylide Yellow AAOA), 97 (fast yellow FGL), 110 (isoindolinone yellow 3RLT), and 155 (Sandrine yellow 4G) and 180 (bends imidazolone) are mentioned, and it is C.I.Pigment most preferably. Yellow 17, 155, 180 is mentioned.

[0031] As a red system coloring agent, furthermore, for example C. -- I.Pigment Red 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 17, 18, 22, 23, 31, 37, 38, 41, and 42, 48:1, 48:2, 48:3, 48:4, 49:1, 49:2, 50:1, 52:1, 52:2 53:1, 54, 57:1 58:4 60:1 63:1 63:2 64:1, 65, 66, 67, 68, 81, 83, 88, 90, 90:1, 112, 114, 115, 122, 123, 133, 144, 146, 147, 149, 150, 151, 166, 168, 170, 171, 172, 174, 175, 176, 177, 178, 179, 185, 187, 188, 189, 190, 193, 194, 202, 208, 209, 214, 216, 220, 221, and 224, 242, 243, 243:1, 245, 246, 247 grade are mentioned. desirable -- C.I.Pigment Red 48:1 (generic name barium red), 48:2 (calcium red), 48:3 (strontium red), 48:4 (manganese red), 53:1 (Lake Red), 57:1 (brilliant carmine 6B), 122 (Quinacridone Magenta 122), and 209 (dichloro Quinacridone red) mention -- having -- most -- desirable -- C.I.Pigment Red 57: -- 1, 122 and 209 are mentioned.

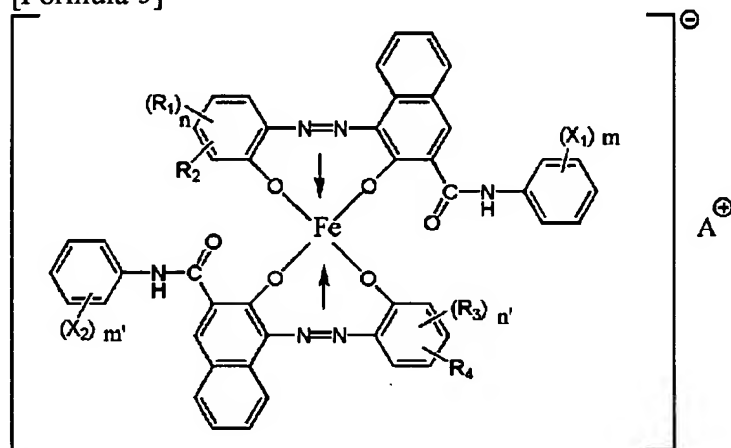
[0032] As for the content of these coloring agents, it is desirable that it is 1 - 20 % of the weight to the whole toner. It is still more desirable that it is 2 - 15 % of the weight especially, and it is desirable that it

is especially 2 - 10 % of the weight. These coloring agents can be used in one sort or two sorts or more of combination.

[0033] In this invention, the compound of the following general formula (1) is used as an electrification control agent. Since it can distribute to homogeneity in the polyester resin which uses cyclohexane dimethanol as an alcoholic component, the electrification control agent of the general formula (1) used by this invention is little, and can obtain the desired amount of electrifications. Moreover, by using with the polyester resin used by this invention, it excels in the standup nature of electrification and change of an electrification property can obtain few toners also in printing of many number of copies.

<General formula (1)> [0034]

[Formula 5]

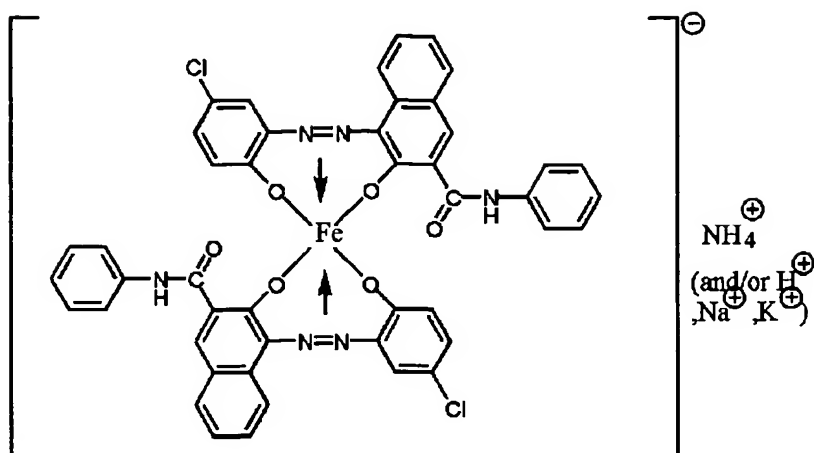


X1 and X2 among [type A hydrogen atom, a low-grade alkyl group, a lower alkoxy group, A nitro group or a halogen atom is expressed, and even if Xtwo are the same as Xone, you may differ. m and m' expresses the integer of 1-3. R1 and R3 A hydrogen atom, The alkyl of carbon numbers 1-18, the alkenyl, a sulfonamide, mesyl, Alkoxy [ of a sulfonic acid, carboxy ester, and the hydroxy \*\* carbon numbers 1-18 ] \*\* Acetylamino, a benzoylamino radical, or a halogen atom is expressed. May differ, even if R3 are the same as R1, and n and n' expresses the integer of 1-3. R2 and R4 express a hydrogen atom or a nitro group, and A+ shows cation ion and expresses ammonium ion, a hydrogen ion, sodium ion, potassium ion, or those mixed ion. ]

[0035] Although the compound of structures various in the range which does not deviate from the structure of a general formula (1) can use it suitably as an electrification control agent used with the toner for electrostatic-charge image development of this invention, the following complex salt or the following salt of structure has higher electrification grant capacity, electrification stability, and transparency, and can use it suitably especially. The structure expression of a desirable electrification control agent is < electrification control agent 1>- <the electrification control agent 3> shown below. Especially a desirable thing is <the electrification control agent 1> especially.

[0036] <Electrification control agent 1> [0037]

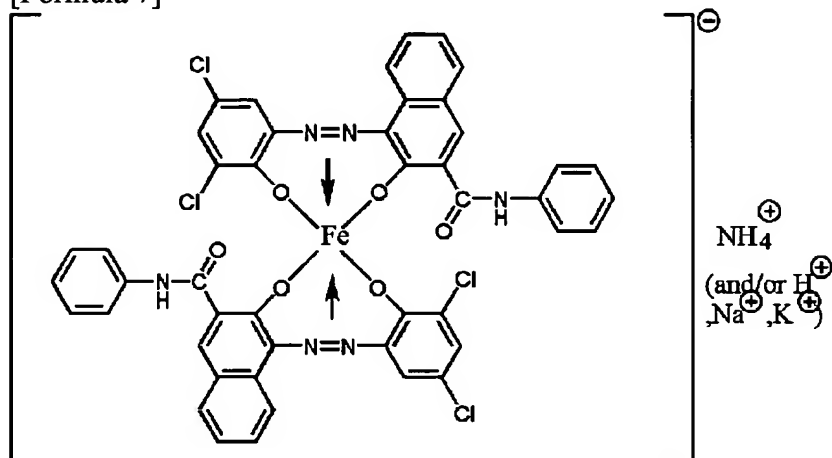
[Formula 6]



Cations are  $\text{NH}_4^+$  and  $\text{H}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , or these mixed ion.

[0038] <Electrifcation control agent 2> [0039]

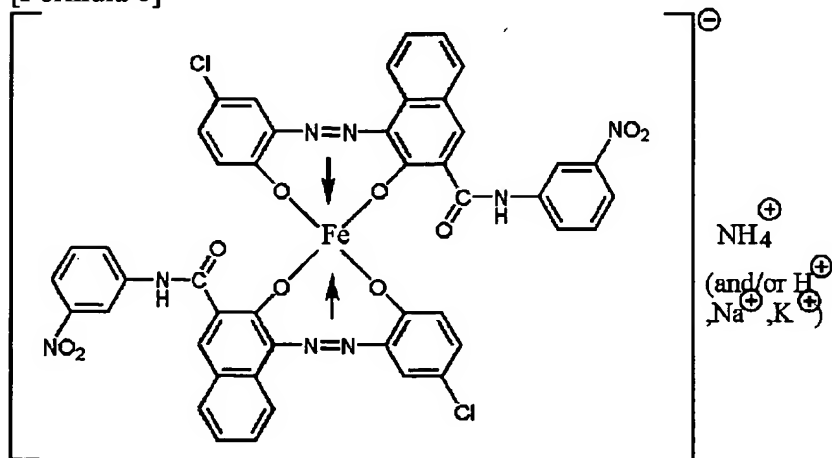
[Formula 7]



Cations are  $\text{NH}_4^+$  and  $\text{H}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , or these mixed ion.

[0040] <Electrifcation control agent 3> [0041]

[Formula 8]



Cations are  $\text{NH}_4^+$  and  $\text{H}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , or these mixed ion.

[0042] As amount of the electrification control agent used, to the binder resin 100 weight section, there is also no lowering of the toner resistance by it being the range of 0.1 - 10 weight section, and being this

range, and sufficient electrification engine performance is obtained. It is 0.3 - 5 weight section more preferably, and it is desirable especially that it is 0.5 - 3 weight section.

[0043] As an electrification control agent which can be used together with the compound of a general formula (1), a well-known electrification control agent can be used conventionally. For example, the resin with which the resin which contains the Nigrosine system color, triphenylmethane dye, quarternary ammonium salt, the 4th class ammonium, and/or the amino group as a forward electrification control agent contains heavy-metal content acid dye, such as the metallic complex of a trimethyl ethane system color and a salicylic acid, the metallic complex of a benzilic acid, a copper phthalocyanine, perylene, Quinacridone, azo pigment, metallic complex azo dye, and azo chromium complex, the phenol system condensate of a calyx allene mold, an annular poly saccharide, a carboxyl group, and/or a sulfonyl group as a negative electrification control agent be used if needed. Since it is a negative triboelectric charging electrification control agent, when using other electrification control agents together, as for the electrification control agent of the general formula (1) used for this invention, it is desirable that it is a negative electrification control agent.

[0044] Moreover, well-known various release agents (henceforth [ this invention ] a wax), for example, a polypropylene wax, polyethylene wax, a polyamide system wax, the Fischer Tropsch wax, carnauba wax, ester wax, etc. can be suitably used for the toner for electrostatic-charge image development of this invention as a release agent until now. What can be preferably used in this invention especially is a wax which uses a higher-fatty-acid ester compound and/or a fatty alcohol compound as a principal component. The dispersibility in the polyester resin of this invention is good, and such a wax has a mold-release characteristic and good sliding nature, and they are desirable. When adding these waxes in a toner, as compared with polyolefine system waxes, such as a polypropylene wax of tales doses, and polyethylene wax, better hot-proof offset nature and fixation reinforcement are obtained.

[0045] furthermore, everything but work as a release agent to which the wax which uses a higher-fatty-acid ester compound and/or a fatty-alcohol compound as a principal component prevents the offset phenomenon at the time of heat roll fixation -- many -- also in printing of several sheets and long duration, without adhering to a carrier front face, when it uses, for example as a toner for two component developers, electrification stabilized in the toner is give, there is no generating of a scattering toner etc., and printing of a high-definition and high definition image is enable.

[0046] As a wax which uses a higher-fatty-acid ester compound and/or a fatty alcohol compound as a principal component, there is synthetic ester wax, such as tetra-behenic acid ester, stearin acid tetradecyl, etc. of carnauba wax, a montan ester wax, a rice wax, a scale insect wax, a lanolin wax, or pentaerythritol, etc.

[0047] It is desirable to use the de-free-fatty-acid mold carnauba wax which removed free fatty acid by purification as carnauba wax. As the acid number of de-free-fatty-acid mold carnauba wax, eight or less are desirable and it is the five or less acid number more preferably. De-free-fatty-acid mold carnauba wax serves as a microcrystal from conventional carnauba wax, and its dispersibility in the inside of polyester resin improves. A montan ester wax is refined from a mineral, and serves as a microcrystal like carnauba wax by purification, and its dispersibility in the inside of polyester resin improves.

[0048] It is desirable that it is 30 or less as the acid number especially in a montan ester wax. Moreover, a rice wax refines a rice bran low and, as for the acid number, it is desirable that it is 13 or less.

[0049] A scale insect wax can be obtained by melting the wax-like component which the larva of a scale insect (alias name IBOTAROMUSHI) secretes in boiling water, and carrying out after [ separation ] cooling solidification of the upper layer, or repeating it. The scale insect wax refined by such means is white in a solid state, shows the very sharp melting point, and is suitable as a wax for toners in this invention. The acid number becomes ten or less by purification, and five or less are desirable as an object for toners.

[0050] A lanolin wax is what refined the Low Mr. matter adhering to the hair of the sheep, and dehydrated, and is the five or less acid number preferably [ using eight or less thing as the acid number ], and more preferably.

[0051] What uses as a principal component the higher alcohol with which the release agent which uses a

fatty alcohol compound as a principal component is obtained by oxidation reaction of paraffin, an olefin, etc. is mentioned. the release agent which uses fatty alcohol as a principal component -- for example, -- "-- uni-phosphorus 425" -- "-- uni-phosphorus 550" (above PETORO Light), "NPS-9210", "a parachor 5070" (above NIPPON SEIRO CO., LTD.), etc. are mentioned.

[0052] It is the most desirable wax that the tetra-behenic acid ester of with an acid number of eight or less carnauba wax, a scale insect wax, and pentaerythritol can use in this invention also in the above example especially.

[0053] As for the contribution to offset-proof nature, what has the melting point in the range of 65-degreeC-130-degreeC with the wax in this invention is especially desirable greatly.

[0054] A wax may be used independently, or it may combine, it may be used, and the good fixation offset engine performance is obtained to binder resin 0.3 - 15 weight section and by carrying out 1-5 weight section content preferably. If fewer than the 0.3 weight section, offset-proof nature will be spoiled, if [ than 15 weight sections ] more, the fluidity of a toner will worsen, and in the case of a two component developer, a SUPENTO carrier will be generated by adhering to a carrier front face, and it will have an adverse effect on the electrification property of a toner.

[0055] In addition, synthetic waxes, such as a polyamide wax, a graft polymerization wax, a conversion polyolefine wax, a polypropylene wax, and polyethylene wax, can also be used together with the wax in this invention, and can be used.

[0056] Various additives (it is called an external additive) can be used for the toner of this invention for the surface treatment of toners, such as fluid improvement in a toner, and electrification property amelioration. As an external additive which can be used by this invention, resin pulverized coal, such as what carried out surface preparation of non-subtlety fine particles, such as a silicon dioxide, titanium oxide, oxidization aluminum, cerium oxide, a zinc oxide, tin oxide, and a zirconium dioxide, and them, for example by hydrophobing processing agents, such as silicone oil and a silane coupling agent, polystyrene, an acrylic, a styrene acrylic, polyester, polyolefine, a cellulose, polyurethane, benzoguanamine, a melamine, nylon, silicon, a phenol, vinylidene fluoride, and Teflon (trademark) etc. be used.

[0057] The silicon dioxide (silica) which carried out hydrophobing processing can use a front face suitably especially by various kinds of polyorganosiloxanes, silane coupling agents, etc. also in these. There are some which consider as such a thing, for example, are marketed by the following trade names.

[0058] AEROSIL R972, R974, R202, R805, R812, RX200, RY200 R809, RX50, RA200HS, RA200H (Japanese Aerosil, Inc.)

WACKER HDK H2000 and H2050EPHDK H3050 -- EP and HVK2150 (Wacker Chemicals yeast AJIA, Inc.)

Nipsil SS-10, SS-15, SS-20, SS-50, SS-60, SS-100, SS-50B, SS-50F, SS-10F, SS-40, SS-70, SS-72F (Japanese Silica Industry),

CABOSIL TG820F (Cabot SUPESCHARUTI KEMIKARUZU ink)

[0059] The particle diameter of an external additive is 1/10 or less desirable especially suitably [ that it is 1/3 or less / of the diameter of a toner ]. Moreover, these external additives may use together two or more sorts of different mean particle diameter. The operating rate of an external additive is 0.1 - 3 % of the weight preferably 0.05 to 5% of the weight to the toner 100 weight section.

[0060] You may make it the toner in this invention include other additives in the interior of a toner particle. As an example, lubricant, such as metallic soap and zinc stearate, can use cerium oxide, silicon carbide, etc. as an abrasive material.

[0061] Moreover, when some or all of a coloring agent is transposed to magnetic powder, it can use as a toner for magnetic 1 component development. As magnetic powder, the powder of alloys, such as ferromagnetic metals, such as iron, cobalt, and nickel, or magnetite, hematite, and a ferrite, or a compound is used. That in which such magnetic powder carried out hydrophobing processing with organic silicon or a titanium compound if needed is also used suitably. The content of magnetic powder has 15 - 70 good % of the weight to toner weight.

[0062] The toner of this invention can be obtained by grinding and classifying resin, a coloring agent, and an electrification control agent, for example, after carrying out melting kneading above the melting point (softening temperature) of resin, although it cannot be based on the specific manufacture approach but can therefore obtain to the very general manufacture approach.

[0063] Concrete for example, above-mentioned resin and an above-mentioned coloring agent are mixed with kneading means, such as 2 rolls, 3 rolls, a pressurized kneader, or a biaxial extruder. Under the present circumstances, that a coloring agent etc. should just distribute to homogeneity in resin, although especially the conditions of that melting kneading are not limited, they are usually 30 seconds - 2 hours in 80-180-degreeC. A coloring agent may use the masterbatch which carried out melting kneading by the Flushing processing or resin, and high concentration beforehand so that it might distribute to homogeneity in resin.

[0064] Subsequently, it pulverizes with grinders, such as a jet mill, after cooling it, and the method of classifying with a pneumatic elutriation machine etc. is mentioned. Although not restricted, especially the mean particle diameter of the particle which constitutes a toner is adjusted so that it may usually be set to 5-15 micrometers. Usually, to the toner parent obtained by carrying out in this way, the particle (it is hereafter called an external additive) of a particle size smaller than a toner parent is mixed using mixers, such as a Henschel mixer.

[0065] The toner in this invention can be used as a two component developer by mixing with a magnetic carrier. In this case, as for the front face of a magnetic carrier, being covered with resin is desirable. Electrification of a developer is stabilized by covering a front face with resin.

[0066] Although the iron powder carrier used for the usual 2 component development method, a magnetite carrier, and a ferrite carrier can be used as a carrier which produces a two component developer using the toner of this invention, since true specific gravity is low, and is high resistance, it excels in environmental stability and it is easy to make it a globular form especially, a ferrite with a good fluidity or a magnetite carrier is used suitably. Especially the configuration of a carrier cannot interfere a globular form, an infinite form, etc., and can use them. Although mean particle diameter is generally 10-500 micrometers, in order to print a high resolution image, 30-80 micrometers is desirable.

[0067] The coating carrier which covered these carriers with resin can also be used suitably. Moreover, as coat resin For example, polyethylene, polypropylene, polystyrene, a polyacrylonitrile, Polyvinyl acetate, polyvinyl alcohol, a polyvinyl butyral, A polyvinyl chloride, a polyvinyl carbazole, a polyvinyl ether polyvinyl ketone, A vinyl chloride / vinyl acetate copolymer, styrene / acrylic copolymer, the straight silicon resin that consists of ORGANO siloxane association, or its denaturation article, A fluororesin, acrylic resin (meta), polyester, polyurethane, a polycarbonate, phenol resin, amino resin, melamine resin, benzoguanamine resin, a urea resin, amide resin, an epoxy resin, etc. can be used. Also in these, especially silicon resin, a fluororesin, and acrylic resin (meta) are excellent in electrification stability, coat reinforcement, etc., and can use it more suitably. That is, it is desirable that it is the resin coat magnetism carrier by which the magnetic carrier was covered with this invention by one or more sorts of resin chosen from silicone resin, a fluororesin, and acrylic resin (meta).

[0068] Although especially the coat approach of the resin to a carrier core material front face does not choose a means, a coat resin solution is mixed with a carrier core material in the dip coating immersed into the solution of coat resin, the spray method which sprays a coat resin solution to a carrier core material front face or the fluidized bed process which sprays a carrier in the condition of having made it floating by floating Ayr, and a kneader coating machine, and the kneader coating-machine method for removing a solvent etc. is mentioned.

[0069] Although it is not limited especially if the solvent used into a coat resin solution dissolves coat resin, toluene, a xylene, an acetone, a methyl ethyl ketone, a tetrahydrofuran, dioxane, etc. can be used, for example. The thickness of the enveloping layer on the front face of a carrier is usually 0.1-3.0 micrometers.

[0070] Although especially the weight rate of the toner of this invention and a magnetic carrier is not restricted, they are usually per carrier 100 weight section, a toner 0.5 - 10 weight sections.

[0071] The two component developer using the toner for electrostatic-charge image development of this

invention can be especially used suitable for the above high-speed machine by the above 30 morem/by 20m/which is the development method of high-speed processing, although it can be used at the usual development rate. Especially, even if it is the above high-speed machine by 45m/, there is no generating of fogging and prolonged printing can be performed in uniform image concentration.

[0072] In this way, although the toner for electrostatic-charge image development of obtained this invention is developed and it is fixed to it on recorded media by the approach of well-known common use, as a fixation method, it is desirable to adopt a heat roll fixation method. What covered the front face of the cylinder object which can heat a toner as a heat roll to the temperature which can carry out melting fixation with the coating resin which has the mold-release characteristic and thermal resistance of silicone resin, a fluoro-resin, etc. is used. By the heat roll fixation method, when print media-ed passes through between two rolls pressed by the suitable pressure which has at least one heat roll which was described above, fixation of a toner is performed.

[0073] The exceptionally remarkable technical effectiveness of the toner for electrostatic-charge image development of this invention is developed more at high speed, and is demonstrated in the development anchorage device with which heat roll fixation is performed. As recorded media in this invention, although each thing of well-known common use can use it, synthetic-resin films, sheets, etc., such as papers, such as a regular paper and resin coat paper, a PET film, and an OHP sheet, are mentioned, for example.

[0074] Moreover, although there is the nonmagnetic 1 component development approach of a contact mold of contacting the development sleeve which supported the developer to the photo conductor drum which has an electrostatic latent image, and developing it as the nonmagnetic 1 component development approach The toner for nonmagnetic 1 component development of this invention by making a toner pass between the electrification members by which the pressure welding was carried out to a development sleeve and it, and carrying out frictional electrification of the toner It can be used especially effective in the nonmagnetic 1 component developing-negatives method of a contact mold for developing the electrostatic latent image formed on the surface of the photo conductor.

[0075] Although it can be used at the usual development rate when using the toner for electrostatic-charge image development of this invention for the developer of a nonmagnetic 1 component development method, it can use suitable for the above high-speed machine by the above 7 morem/especially by 6m/which is the development method of high-speed processing. Especially, even if it is the above high-speed machine by 9m/, there is no generating of fogging and prolonged printing can be performed in uniform image concentration.

[0076]

[Example] Hereafter, this invention is further explained to a detail using an example and the example of a comparison. In addition, the numeric value in a presentation table expresses the "weight section" below. The synthetic example of the binder resin which was used in preparing a toner first is shown below.

[0077]

(Synthetic example 1)

Naphthalene dicarboxylic acid 87 weight sections A terephthalic acid The 249 weight sections 1, 4-cyclohexane dimethanol The 116 weight sections Neopentyl glycol The 104 weight sections Ethylene glycol Twelve weight sections Tetrabutyl titanate The raw material more than the 2.5 weight sections was paid to the 4 Thu openings flask of glass 2L, sequential reduced pressure of a thermometer, a stirring rod, and the nitrogen installation tubing was carried out after the 10-hour reaction at 240 degrees C under the ordinary pressure nitrogen air current in installation and an electric heat mantle heater, and the reaction was continued by 10mmHg. The reaction was pursued by the softening temperature according to ASTM-E 28-517, and when softening temperature amounted to 101 degrees C, it ended the reaction. The obtained polymer was a colorless solid-state and the acid number 6, the glass transition temperature of 71 degrees C by the DSC measuring method, and softening temperature were 102 degrees C.

[0078]



(Synthetic example 2)

Terephthalic acid The 315 weight sections Diethylene glycol 21 weight sections 1, 4-cyclohexane dimethanol The 144 weight sections Ethylene glycol 50 weight sections Tetrabutyl titanate It reacted like the synthetic example 1 using the raw material more than the 2.5 weight sections. The obtained polymer was a colorless solid-state and the acid number 9, the glass transition temperature of 60 degrees C by the DSC measuring method, and softening temperature were 97 degrees C.

[0079]

(Synthetic example 3)

Isophthalic acid The 116 weight sections A terephthalic acid The 166 weight sections Trimellitic anhydride 38 weight sections 1, 4-cyclohexane dimethanol 72 weight sections Neopentyl glycol The 104 weight sections Ethylene glycol 38 weight sections Tetrabutyl titanate The raw material more than the 2.5 weight sections was paid to the 4 Thu openings flask of glass 2L, sequential reduced pressure of a thermometer, a stirring rod, and the nitrogen installation tubing was carried out after the 10-hour reaction at 240 degrees C under the ordinary pressure nitrogen air current in installation and an electric heat mantle heater, and the reaction was continued by 10mmHg. The reaction was pursued by the softening temperature according to ASTM-E 28-517, and when softening temperature amounted to 140 degrees C, it ended the reaction. The obtained polymer was a colorless solid-state and the acid number 5, the glass transition temperature of 65 degrees C by the DSC measuring method, and softening temperature were 143 degrees C.

(Synthetic example 4)

Terephthalic acid The 315 weight sections Diethylene glycol 21 weight sections Neopentyl glycol The 114 weight sections Ethylene glycol 45 weight sections Tetrabutyl titanate It reacted like the synthetic example 1 using the raw material more than the 2.5 weight sections. The obtained polymer was a colorless solid-state and the acid number 8, the glass transition temperature of 49 degrees C by the DSC measuring method, and softening temperature were 97 degrees C.

[0080]

(Synthetic example 5)

Isophthalic acid The 415 weight sections A terephthalic acid The 415 weight sections Polyoxyethylene - (2.0) -2, 2-screw (4-hydroxyphenyl) Propane The 1650 weight sections Tetrabutyl titanate The raw material more than 6 weight sections was paid to the 4 Thu openings flask of glass 2L, sequential reduced pressure of a thermometer, a stirring rod, and the nitrogen installation tubing was carried out after the 24-hour reaction at 230 degrees C under the ordinary pressure nitrogen air current in installation and an electric heat mantle heater, and the reaction was continued by 10mmHg. The reaction was pursued by the softening temperature according to ASTM-E 28-517, and when softening temperature amounted to 99 degrees C, it ended the reaction. The obtained polymer was a colorless solid-state and the acid number 7, the glass transition temperature of 62 degrees C by the DSC measuring method, and softening temperature were 103 degrees C.

[0081]

(Synthetic example 6)

Terephthalic acid The 283 weight sections Polyoxypropylene (2 2) -2, 2-screw (4-hydroxyphenyl) Propane The 527 weight sections Trimellitic anhydride 45 weight sections Tetrabutyl titanate The 2.5 weight sections [0082] The above raw material was paid to the 4 Thu openings flask of glass 2L, sequential reduced pressure of a thermometer, a stirring rod, and the nitrogen installation tubing was carried out after the 15-hour reaction at 240 degrees C under the ordinary pressure nitrogen air current in installation and an electric heat mantle heater, and the reaction was continued by 10mmHg. The reaction was pursued by the softening temperature according to ASTM-E 28-517, and when softening temperature amounted to 133 degrees C, it ended the reaction. The obtained polymer was a colorless solid-state and the acid number 5, the glass transition temperature of 64 degrees C by the DSC measuring method, and softening temperature were 134 degrees C.

[0083]

(Example 1)



<Manufacture of a toner> Resin of the example 1 of - composition 93 weight sections and mho gal L Four weight sections (carbon black; product made from Cabot SUPESHARUTI KEMIKARUZU ink) - electrification control agent 1 One weight section (in addition -- the cation of the electrification control agent 1 -- ammonium ion -- 75-98-mol % -- it contains and, otherwise, a hydrogen ion, sodium ion, and potassium ion are contained)

- Purification carnauba wax No.1 Two weight sections (the acid number 5, product made from SERARIKA NODA) It mixes with a Henschel mixer and kneads with a biaxial kneading machine. Thus, the obtained kneading object was ground and classified and the "toner original object A" with a volume mean particle diameter of 7.5 micrometers was acquired.

[0084]

- Above "the toner original object A" The 100 weight sections and silica made from Japanese Aerosil "R-812" After mixing 1 weight section with a Henschel mixer, a sieve or \*\* was carried out, and "Toner A" was obtained.

[0085] Friction mixing of the four sections and the Powdertech carrier "ferrite carrier F-150" 96 section was carried out for the <adjustment of developer> toner A, and Developer A was adjusted.

[0086] The developer A by the toner which manufactured the toner by combination of a table -1 like the example 1 hereafter, and used straight chain polyester resin as binder resin (example 1) - Developer E (example 5) and Developer H (example 1 of a comparison) - Developer J (example 3 of a comparison) were manufactured. Moreover, the developer F by the toner which used branching resin as binder resin (example 6), Developer G (example 7) and Developer K (example 4 of a comparison) - Developer L (example 5 of a comparison) were manufactured.

[0087]

[A table 1]

表 - 1. 配合表

例	現像剤	樹脂	着色剤	W A X	帯電制御剤	体積 平均径 ( $\mu\text{m}$ )
実施例 1	A	合成例 1 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 1 1 部	7.4
実施例 2	B	合成例 1 9 2 部	モーガル L 5 部	PETB 2 部	帯電制御剤 1 1 部	7.6
実施例 3	C	合成例 1 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 2 1 部	7.5
実施例 4	D	合成例 2 9 2 部	モーガル L 5 部	カルナバ WAX 2 部	帯電制御剤 3 1 部	7.4
実施例 5	E	合成例 2 9 3 部	モーガル L 4 部	PPWAX 2 部	帯電制御剤 1 1 部	7.4
実施例 6	F	合成例 3 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 1 1 部	7.6
実施例 7	G	合成例 1 2 3 部 合成例 3 7 0 部	モーガル L 4 部	PETB 2 部	帯電制御剤 1 1 部	7.6
比較例 1	H	合成例 4 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 1 1 部	7.4
比較例 2	I	合成例 5 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 1 1 部	7.5
比較例 3	J	合成例 1 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	S - 3 4 1 部	7.5
比較例 4	K	合成例 3 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	S - 3 4 1 部	7.5
比較例 5	L	合成例 6 9 3 部	モーガル L 4 部	カルナバ WAX 2 部	帯電制御剤 1 1 部	7.5

[0088] The display in a table is as follows.

- the cation of the electrification control agent 1, the electrification control agent 2, and the electrification control agent 3 -- ammonium ion -- 75-98-mol % -- contain and, otherwise, contain a hydrogen ion, sodium ion, and potassium ion.

- Mho gal L ; Carbon black "the product made from Cabot SUPESHARUTI KEMIKARUZU ink"

- KARUNABA WAX ; - scale insect WAX made from carnauba wax No.1 (acid number 5) SERARIKA NODA ; -PETB made from purification snow low No.1 (acid number 2) SERARIKA NODA ;

pentaerythritol -- tetra--- behenic acid ester and PPWAX;550P (a polypropylene wax, Sanyo Chemical Industries, Ltd. make)

\*\*S-34 ; the product made from azo dye (chromium complex salt) "the ORIENT chemistry" [0089] The non-established image sample of A-4 paper size was produced with the test machine which converted the copying machine of the 2 component development method of <fixation offset test by heat roll fixation> marketing, and fixation initiation temperature and the existence of an offset phenomenon were checked in the following test condition using the heat roll fixation unit of the following specification. Material of roll Above : 4 fluoridation ethylene Below : HTV silicon A profile of roller Path : 50mm Die length : 370mm A top roll load : 7kg A top / bottom roll nip width of face : 4mm Paper feed rate : In order to measure 100 mm/sec fixation initiation temperature, it asked for the image concentration residual ratio calculated by the following formula.

[0090] Image concentration residual ratio = image concentration / front [ the said left trial ] image concentration \* image concentration was measured in Macbeth image concentration meter RD-918 after the fastness test.

\* The image concentration after a fastness test is the image concentration after grinding a fixation image using a Gakushin-type fastness-to-rubbing testing machine (load: 200g, grinding actuation:5 stroke). It considered as the level which is satisfactory practically at 80% or more of image concentration residual ratios, and the minimum temperature was made into fixation initiation temperature.

[0091] Offset initiation temperature observed the fixation image sample, and made it the temperature an offset phenomenon is visually accepted to be. The result was shown in a table -2 and a table -3.

[0092] While measuring the concentration and greasing concentration of the image section in the continuation print of 50000 sheets using the copying machine of <printing torture test> marketing, the amount of electrifications of a developer was measured. Image concentration and a greasing were measured by Macbeth concentration meter RD-918. In addition, the greasing deducted and asked for the blank paper concentration before a print from the white section concentration after printing. \*\* and the time or more of 0.03 were made [ the time of the difference being less than 0.01 ] into x for O and the time less than of 0.01 to 0.03.

[0093] About the amount of electrifications, the toner was extracted from the interior of a developer for every printing number of sheets, and it measured with the amount measurement machine of blowing off electrifications. The result was shown in a table -2 and a table -3.

[0094] <Heat-resistant condensation test> It was left in the thermostat which put in toner 10g before mixing with a carrier to cylindrical shape Pori Kapp without a 100 cc lid, and was set as 65 degrees C. Pori Kapp was slowly leaned for Pori Kapp after 24-hour progress on ejection and a level base, and the inner toner was taken out. The condition that close was maintaining mostly the configuration when keeping condensed to Pori Kapp even if there is no condensation by the welding of toner particles, and it sent to O the condition that toner powder spread on a base in that case, and it sent the condition of getting loose simply, on \*\* and a base, when it poked with the finger, although there was condensation a little was made into x. The result was shown in a table -2 and a table -3.

[0095]

[A table 2]

表-2. 直鎖型樹脂を用いたトナーのテスト結果

	耐熱凝集性	定着開始温度 ℃	ワセット開始温度 ℃	印刷テスト	初期	10 kP	30 kP	50 kP
実施例 1	○	105	150	帯電量	-20	-20	-20	-19
				画像濃度	1.40	1.40	1.41	1.41
				地汚れ	○	○	○	○
実施例 2	○	105	150	帯電量	-20	-19	-19	-19
				画像濃度	1.40	1.40	1.40	1.40
				地汚れ	○	○	○	○
実施例 3	○	105	150	帯電量	-19	-19	-19	-18
				画像濃度	1.41	1.40	1.40	1.40
				地汚れ	○	○	○	○
実施例 4	○~△	105	145	帯電量	-19	-18	-18	-18
				画像濃度	1.41	1.41	1.41	1.42
				地汚れ	○	○	○	○
実施例 5	○~△	120	160	帯電量	-19	-18	-18	-17
				画像濃度	1.40	1.41	1.42	1.43
				地汚れ	○	○	○	○
比較例 1	×	100	135	帯電量	-19	-19	-17	-14
				画像濃度	1.40	1.40	1.42	1.45
				地汚れ	○	○	△	△
比較例 2	○	115	150	帯電量	-19	-19	-16	-14
				画像濃度	1.39	1.40	1.42	1.43
				地汚れ	○	○	○	△
比較例 3	○	105	150	帯電量	-17	-15	-12	-11
				画像濃度	1.40	1.42	1.44	1.45
				地汚れ	○	○	△	×

[0096] The display in a table is as follows.

The "amount of electrifications"; Less than [  $\mu\text{C/g}$  "greasing assessment" O:0.01 ], less than [ \*\*:0.01-0.03 ], more than x:0.03[0097]

[A table 3]

表-3. 分岐型樹脂を用いたトナーのテスト結果

	耐熱凝集性	定着開始温度 ℃	ワセット開始温度 ℃	印刷テスト	初期	10 kP	30 kP	50 kP
実施例 6	○	135	180	帯電量	-19	-19	-19	-18
				画像濃度	1.42	1.42	1.42	1.41
				地汚れ	○	○	○	○
実施例 7	○	125	180	帯電量	-18	-18	-17	-17
				画像濃度	1.41	1.42	1.42	1.41
				地汚れ	○	○	○	○
比較例 4	○	135	180	帯電量	-18	-16	-14	-11
				画像濃度	1.42	1.44	1.44	1.48
				地汚れ	○	○	△	×
比較例 5	○	145	180	帯電量	-18	-18	-16	-14
				画像濃度	1.43	1.44	1.44	1.43
				地汚れ	○	○	○	△

[0098] The display in a table is as follows.

The "amount of electrifications"; Less than [  $\mu\text{C/g}$  "greasing assessment" O:0.01 ], less than [ \*\*:0.01-0.03 ], more than x:0.03[0099]

The cartridge which extracted and washed the exclusive toner from the cartridge of the printer (the "IPUSHIO color 2000" by Ricoh Co., Ltd.) using the nonmagnetic 1 component development method of <printing test of nonmagnetic 1 component developer> marketing was filled up with the toner obtained in each example and the example of a comparison, and continuation printing of 10000 sheets was performed to it. The toner layer on a development sleeve is uniform, the condition that there was no generating of a defect in any way was judged to be O, and the case where ununiformity parts, such as a stripe, occurred was judged to be x. Moreover, the condition that a lot of \*\*, toner omissions, or toner scattering were accepted in the condition that O, little toner omission, or toner scattering is accepted in the condition of a toner not falling from the development sleeve with which the cartridge was equipped, or scattering around (toner omission) and a developer and not soiling the interior of a machine (toner scattering) was judged to be x. The image concentration and the greasing of a print were measured by Macbeth concentration meter RD-918. In addition, the greasing deducted and asked for the blank paper concentration before a print from the white section concentration after printing. \*\* and the time or more of 0.03 were made [ the time of the difference being less than 0.01 ] into x for O and the time less than of 0.01 to 0.03. The result was shown in a table -4.

[0100]

[A table 4]

表-4. 非磁性一成分現像剤印刷テスト結果

	トナー落ち・トナー飛散		画像濃度		地汚れ		スリープ上の欠陥
	初期	10000枚	初期	10000枚	初期	10000枚	
実施例 1	○	○	1.41	1.42	○	○	○
実施例 2	○	○	1.40	1.42	○	○	○
実施例 3	○	○	1.41	1.43	○	○	○
実施例 4	○	○	1.41	1.42	○	○	○
実施例 5	○	△	1.42	1.43	○	○	○
実施例 6	○	○	1.41	1.42	○	○	○
実施例 7	○	○	1.42	1.43	○	○	○
比較例 1	○	×	1.40	1.48	○	×	×
比較例 2	○	△	1.41	1.43	○	△	△
比較例 3	○	△	1.42	1.43	○	△	△
比較例 4	○	△	1.41	1.44	○	△	△
比較例 5	○	△	1.41	1.42	○	△	△

[0101]

[Effect of the Invention] According to this invention, also when continuation printing is carried out, stable electrification behavior is shown, the standup of electrification is good and the toner for electrostatic-charge image development with which a high-definition image is obtained is obtained. Moreover, adhesion in the heat condensation or developer in the interior of a developer cannot occur, but the preservation stability under an elevated temperature is good, and can be established more at low temperature, and the toner for electrostatic-charge image development suitable for a heat roll fixation method in which good fixation / offset property is shown in a broad temperature field can be obtained. The toner for electrostatic-charge image development suitable for the 2 component development method developed especially at high speed and a nonmagnetic 1 component development method can be obtained.

[Translation done.]